INSTRUCTION MANUAL FOR THE COLLINS EAGLET
Pulmonary Diagnostic Spirometer

#762001

Version: February 2003

© Copyright 2003 Collins Medical, Inc.

Caution
Federal law restricts this device to
sale by or on the order of a physician.

PRODUCT CERTIFICATION

Collins Medical, Inc. certifies that this equipment was thoroughly inspected and tested and met its published specifications prior to shipment from the factory.

GENERAL WARRANTY STATEMENT

This equipment is warranted as set forth below and extends only to the Buyer purchasing the equipment directly from Collins Medical, Inc. (the Company), or through its Dealers, Distributors, or Agents as equipment.

This equipment is warranted by Collins Medical, Inc. to be free from defects of workmanship and materials for a period of one year after delivery (except as stated below), provided that it is properly operated under conditions of normal use. The Company's sole obligation under the foregoing warranty is limited to making replacements, repairs, or issuing credit for equipment or parts thereof (at the Company's option) which are found to be defective. This equipment may be returned prepaid to Collins Medical, Inc. after prior notification has been given and approval obtained for the return.

Rubber parts and other parts which are subject to rapid deterioration over which the Company has no control are warranted for ninety (90) days.

Collins Medical, Inc. shall not be liable to the Buyer for consequential damages, or damages of any kind based upon a claim for breach of warranty other than as stated above.

The foregoing warranty shall not apply, and Collins Medical, Inc. shall be relieved of any obligation or liability, if this equipment has been repaired or altered, including the use of components other than those manufactured or approved by the Company, by anyone other than the Company, or if this equipment has been subject to abuse, misuse, negligence, or accident.

Installation and/or use of software programs or hardware, other than those installed by Collins Medical, Inc., which leads to corruption of computer hardware and/or software is not covered under the terms of this warranty and may also void the original warranty on the computer and/or computer peripherals supplied by Collins.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES (EXCEPT TITLE) EXPRESSED OR IMPLIED, INCLUDING WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

TABLE OF CONTENTS

SECTION ONE - CPL Hardware

System Description 5
Manuals 5
Collins Eaglet Specifications 6
Safety Precautions 7
Labeling 8
Installation 10
    Preparation 10
    Unpacking 10
    Moving the Eaglet 11
    Cable and Power Cord Connections 11
Powering Up the System 13
Preparing the Notebook Computer 14
    For Microsoft Windows® XP (Home Edition) 14
    For Microsoft Windows® 2000 16
Preparing the Eaglet for Calibration and Verification 19
Preparing the Eaglet for Testing 19

SECTION TWO -- PERIODIC MAINTENANCE

Warning 21
Customer Support 21
Routine Cleaning of the Eaglet Handle 21
Cleaning the Pneumotach 22
Cleaning the Reusable Mouthpieces 24
Disinfection Procedure for the Pneumotach and Reusable Mouthpieces 24
Replacing the Pneumotach 25
Supplies Listing 26
References 26

SECTION THREE -- TROUBLESHOOTING

Warning 27
Customer Support 27
Manuals 27
Troubleshooting Guide 27
User Problem Checklist 31

LIST OF FIGURES

FIGURE NUMBER **PAGE NUMBER**

1-1. The Collins Eaglet 5
1-2. Symbols that May be Found on the Eaglet 8-9
1-3. Eaglet Parts 10
1-4. Plugging the USB Cable into the Eaglet 11
1-5. Plugging the Eaglet Cable into the USB Port on the Computer 12
1-6. Remaining Cable and Power Cord Connections for Eaglet 13
1-7. Performance Settings for Notebook Computer - Windows® XP 14
1-8. Power Management Settings for Notebook Computer - Windows® XP 15
1-9. Advanced Power Management Settings for Notebook Computer - Windows® XP 16
1-10. Power Management Settings for Notebook Computer - Windows® 2000 17
1-11. Advanced Power Management Settings for Notebook Computer - Windows® 2000 18
1-12. Disabling Hibernate Support Button for Notebook Computer - Windows® 2000 18
1-13. Calibration/Verification Setup for the Eaglet 19
1-14. Attaching the DC-2 Filter to the Patient Port 19
1-15. The Patient Holding the Eaglet during Testing 20
2-1. O-Ring at Rear of Pneumotach Sleeve 22
2-2. Pulling the Pneumotach out of the Eaglet Body 23
2-3. Lining up the Pneumotach Notch with the Seam in the Handle 23
2-4. Location of Pneumotach Screen 25

SECTION ONE -- EAGLET HARDWARE

Description

The Collins Eaglet is a hand-held, flow-based spirometry device used to determine FVC, SVC and MVV values. This portable instrument is a member of the Collins family of computerized testing devices, all of which operate under the PLUSsql/2000 Windows®-based software platform.

Other Collins PLUS/2000 systems include modules for conducting flow and volume-based spirometry, plethysmography, gas dilution lung volumes, diffusion and exercise testing.

Each of these systems, including the Eaglet, shares the Collins PLUS/2000 software manual, which describes configurable aspects of the software, patient testing, report and database functions. Each system also has its own hardware manual. You are currently reading the Eaglet Hardware Manual., which describes the physical aspects of the Collins Eaglet, such as installation, component identification, maintenance and troubleshooting. Refer to the PLUS/2000 Software manual for instructions on conducting pneumotach-based FVC, MVV and SVC testing.

The computer, monitor and printer, along with the Eaglet unit, make up the Eaglet system. Typically the Eaglet is configured with a Notebook computer, though it may be configured with a desktop system. Refer to *Eaglet Specifications*, which is next in this section, for computer system requirements.

Figure 1-1. The Collins Eaglet

COLLINS EAGLET SPECIFICATIONS

(For specifications of the Eaglet, refer to the listing below. For all other system components, refer to the appropriate manual.)

Type: Flow

Dimensions: 7"L x $3^3/_4$"W x 2"D (17.8cm L x 9.5cm W x 5.1cm D) without DC-2 filter

Weight: .6 lbs. (.27 kg)

Electrical Requirements:
5 VDC @ 50 mA (supplied through USB connection with computer)

Operating Environment:
Temperature: 13 to 46 Degrees C (55 to 105 Degrees F)
Relative Humidity: 0% to 95%

Storage and Transportation Environment:
Temperature: -40 to 70 Degrees C (-40 to 158 Degrees F)
Humidity: 10% to 90% (non-condensing)

Auto Zero: Yes

Type of Pneumotach:	Silverman "low thermal mass", single-screen pneumotach
Linearity:	2%
Resistance:	<0.5 cm H_2O/L/sec
Accuracy:	+/-3%
Range:	+/- 15 L/sec

Computer Hardware Minimums (warranted only for use with Collins-approved computer configurations)

Computers:	Pentium II 350 MHz (1.2 Gb or higher recommended) 64 MB RAM (128 MB or higher recommended) USB Port Standard CD-ROM Drive
Storage Device:	2 GB Hard disk drive with minimum of 1.0 free space. (Additional free hard disk space is required if installing over a network.)
Printers:	Windows® 2000 Compatible
Monitors:	800 x 600 minimum graphics resolution

Parameters Measured: Spirometry -- FVC, MVV, SVC

Equipment Classification
Class I
Continuous Use with Short-Time Loading
Type B Applied Part

Safety Precautions

This section discusses certain safety precautions:

The Collins Eaglet has been tested and shown to be compliant to UL2601-1 and CAN/CSA C22.2 NO. 601.1 However, the following precautions must be observed for auxiliary equipment:

a. Use of a non-601 or non-Class II approved computer, connected to the system from within the patient environment, requires external ground connection from Eaglet to earth ground.

   And

   an external ground connection from the computer to the ground.

b. The power cord for each component must be individually connected to a wall source.
c. Operate the Eaglet only when the power cords for the system are plugged into "U" grounded outlets (3-holed outlets).
d. Unplug the power cords in the event that any servicing is required.
e. All system components are fit for use within the patient environment provided external grounding has been implemented per instructions.
f. The Eaglet unit has been tested and meets the latest EMC requirements for immunity and emissions of IEC 60601-1-2:2001-09, 2nd Ed. If for some reason you are having problems with interference, contact the Service Department at 800-635-3200. Examples of occurrences that could interfere with testing include: power supply transients, magnetic interference, mechanical interaction, vibration, thermal radiation and optical radiation.
g. Do not operate the Eaglet or other system components on any voltage other than that specified.
h. The Eaglet packaging is recyclable (corrugated cardboard, plastic bubble wrap) in many locations. Otherwise, packaging can be disposed of through normal waste disposal methods according to local regulations. The accessories used are disposable at their respective ends-of-life as normal waste. This includes the mouthpieces, filters and calibration syringe. The printed circuit boards can easily be removed from the interface and disposed of separately according to local guidelines concerning printed circuit boards.

   Good hygiene practice when handling used filters and/or mouthpieces mandate not touching the parts that came into direct contact with the patient's mouth or aerosolized droplets from the patient's effort. Dispose of filters and mouthpieces as ordinary waste, or as specified by your institution.

Labeling

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

CAUTION statements identify conditions or practices that could result in damage to equipment.

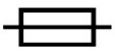
Following are symbols that may be found on the Eaglet and their meanings:

High Voltage

Attention: Consult accompanying documents.

Protective Earth Ground

Type of Applied Part - B



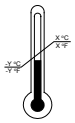
Fuse

Alternating Current

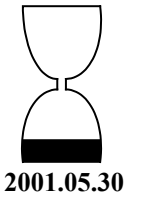
Power ON

Power OFF

Item for single use (do not use more than once)



Indicates the upper and lower temperatures allowed for transport and storage.

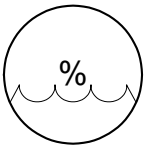


Indicates the date by which the product must be used, in the format Year.Month.Date

Heavy Weight

Fragile

Keep Dry



Transport and storage humidity conditions

Figure 1-2. Symbols that May be Found on the Eaglet

Installation

Preparation

1. This section describes how to prepare for installation, unpack and position the Eaglet and related accessories. The actual installation procedure follows this section.

2. Keep the following in mind when preparing an area for system installation:

   a. Identify an area for location of the Eaglet, computer, monitor, keyboard, mouse, and printer.

   b. Verify that there is sufficient area, height, and placement to provide an optimum workflow between keyboard information entry, patient positioning, and patient traffic.

   c. Consider cable lengths, doorways, traffic areas, patient placement, and equipment usage.

   d. Discuss alternatives with your department head before setting up the equipment.

   e. If a situation requires additional materials (such as a worktable or movement of equipment within the department), start this process immediately to avoid prolonged installation delays.

Unpacking

1. The Eaglet system comes packaged in 1 box, which is identified by the serial number on the outside and contains the Eaglet handle with pneumotach core inside, USB Cable, box of DC-2 filters, noseclips, software CD and documentation CD. If you have ordered the notebook computer, it also comes with the notebook and accompanying case. Refer to Figure 1-3 to identify the pneumotach, handle, DC-2 filter and USB cable.

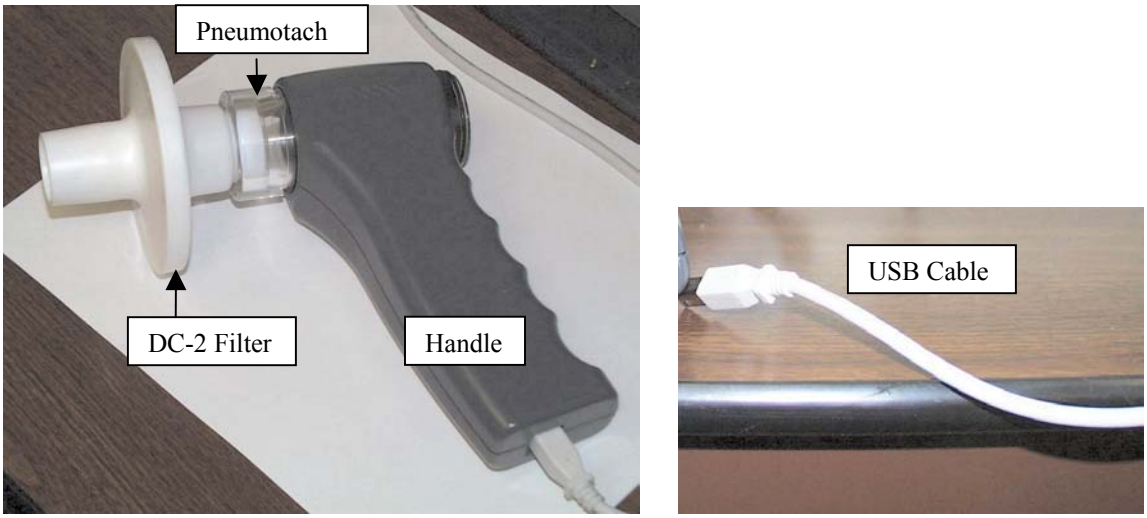


Figure 1-3. Eaglet Parts

2. Place the Eaglet box on a level surface and open it from the top.

3. Remove the Eaglet and the rest of the contents from the box, being sure to examine all packing materials for small parts before discarding.

4. Inspect all equipment for damage. Even though, before leaving the factory, all Collins instrumentation and related equipment have met strict mechanical and electrical quality control standards as of the date

of manufacture, damage sometimes occurs during shipping. Should any damage be found, contact the Customer Service Manager at 800-635-3200 or your local distributor for further handling instructions.

5. Make sure all packing materials are removed from the boxes before any attempt is made to assemble or start up the equipment.

6. When unpacking, be sure to keep all equipment, accessories and cabling out of high traffic areas.

Moving the Eaglet

To move the Eaglet from one location to another, make sure that all cables and power cords are unplugged and that they are kept free of the unit so as not to be damaged.

Cable and Power Cord Connections

1. The following cabling instructions and accompanying diagram represent a sample cabling configuration. Keep in mind that depending on the computer configuration, yours may be different. If you have a laptop computer, ignore the instructions to plug in the keyboard and monitor.

2. In addition to the Safety Precautions at the beginning of this section, observe the Caution note below.

CAUTION:
Do not place the Eaglet directly in the flow path of an HVAC duct.

3. The first step is to connect all system components to the computer via the cables provided.

4. Plug the appropriate end of the USB cable into the connector at the base of the Eaglet.

Figure 1-4. Plugging the USB Cable into the Eaglet

5. Plug the other end of the USB cable into a USB port on the computer.

Figure 1-5. Plugging the Eaglet Cable into the USB Port on the Computer

6. Plug the cable of the computer keyboard into the circular port reserved for it at the rear of the computer.

7. Plug the video monitor cable into the adapter reserved for the monitor on the rear of the computer. Secure the screws at both ends of this and all other connectors with a small screwdriver.

8. Plug one end of the printer cable into the appropriate connector on the printer. Plug the other end into the adapter reserved for the printer at the rear of the Computer.

9. Plug the power cords for the printer and monitor into appropriate, individual wall outlets. Refer to *Safety*.

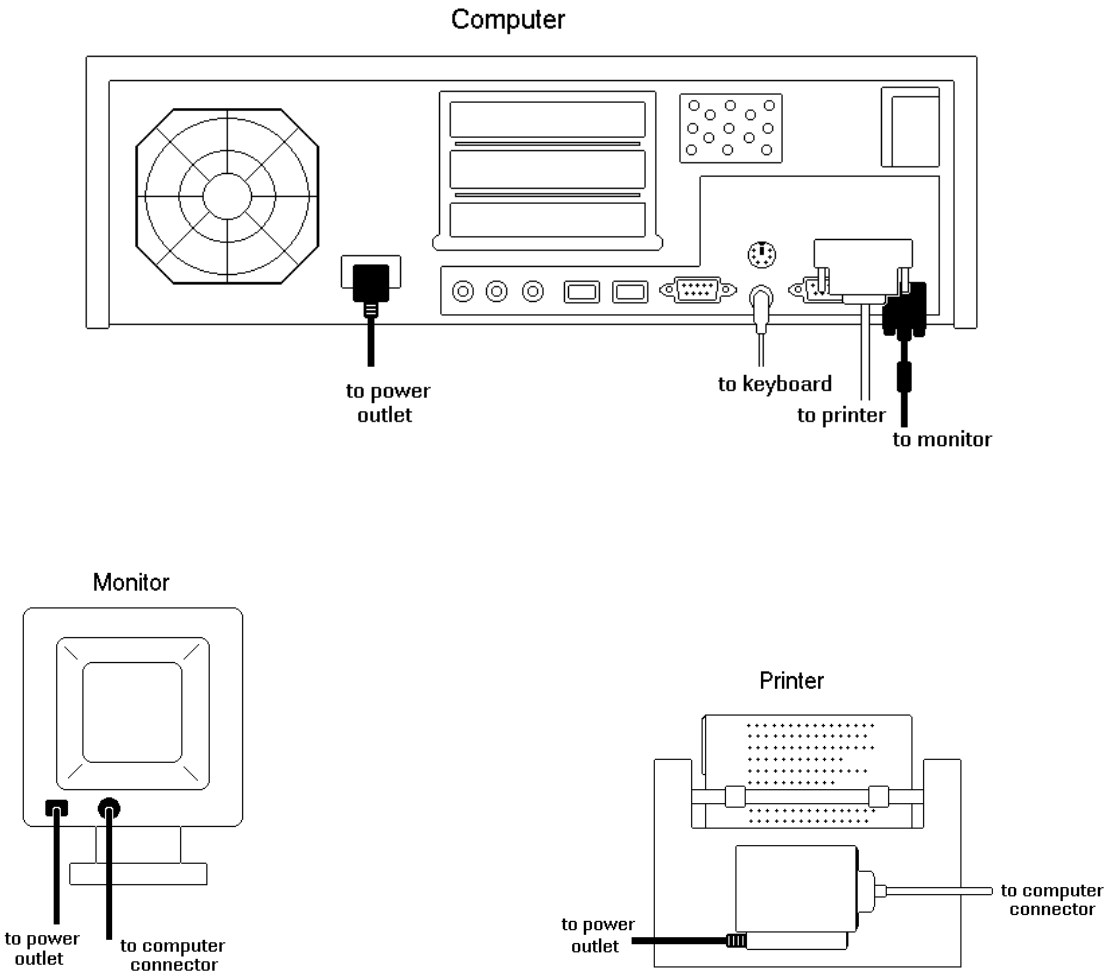


Figure 1-6. Remaining Cable and Power Cord Connections for the Eaglet

Powering up the System

1. Be sure to observe the *Safety Precautions*, which precede the Eaglet Installation instructions.

2. The monitor, printer, and computer must each be plugged into an individual isolated wall outlet. This requires that each component be powered up individually by turning on the power switch. The Eaglet receives its power from the USB port on the computer and will be powered up when the computer is.

3. Turn on each of the other system components according to their respective documentation.

4. The monitor will display a series of system data, followed by the Windows® Desktop with the available applications.

5. Adjust the monitor screen for brightness and clarity according to the monitor documentation.

Preparing the Notebook Computer

In order for the Collins USB devices, such as the Eaglet, to work properly with the currently approved notebook computers, the following conditions have to be met:

- ***Microsoft Windows® XP (home edition)***

  The Power management features and the operating system performance settings on the notebook computers must be set according to the following guidelines:

  - The operating system should be configured for ***optimum performance*** in order to remove delays in the graphical screen updating.

  - The operating system's automatic (default) ***hibernation*** and ***standby*** mode settings must be disabled**.**

  - The operating system's ***lid closing settings*** on the notebook computer must also be set to ***do nothing*** rather than go on ***standby*** or ***hibernation***.

  - The computer should never be put in ***standby*** or ***hibernation*** modes manually while connected to a Collins device via the USB cable. Should this ever happen accidentally, the Collins USB device should be momentarily disconnected and than reconnected again before resuming device operations.

  The previously motioned operating system settings can be configured by performing the following steps:

  - **Performance Settings**
    1. Right click on My Computer and select ***Properties.***
    2. Click the ***Advanced*** Tab and select ***Settings for performance.***
    3. In the options presented, select: ***Adjust for best performance.***
    4. Done.

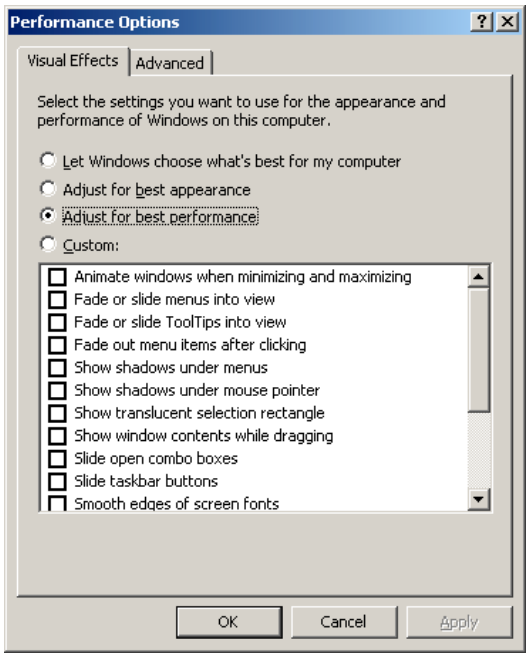

Performance Options
Visual Effects
Advanced
Select the settings you want to use for the appearance and performance of Windows on this computer.
Let Windows choose what's best for my computer
Adjust for best appearance
Adjust for best performance
Custom:
Animate windows when minimizing and maximizing
Fade or slide menus into view
Fade or slide ToolTips into view
Fade out menu items after clicking
Show shadows under menus
Show shadows under mouse pointer
Show translucent selection rectangle
Show window contents while dragging
Slide open combo boxes
Slide taskbar buttons
Smooth edges of screen fonts
OK
Cancel
Apply

Figure 1-7. Performance Settings for the Notebook Computer - Windows® XP

- **Power management settings**
    1. Click ***Start***, then ***Settings*** and then ***Control Panel***.
    2. Select ***Power Options.***
    3. In the Power options dialog box, select ***Power Schemes***
    4. Set the ***system stand by*** options to ***Never***.
    5. Set the ***system hibernates*** options to ***Never***

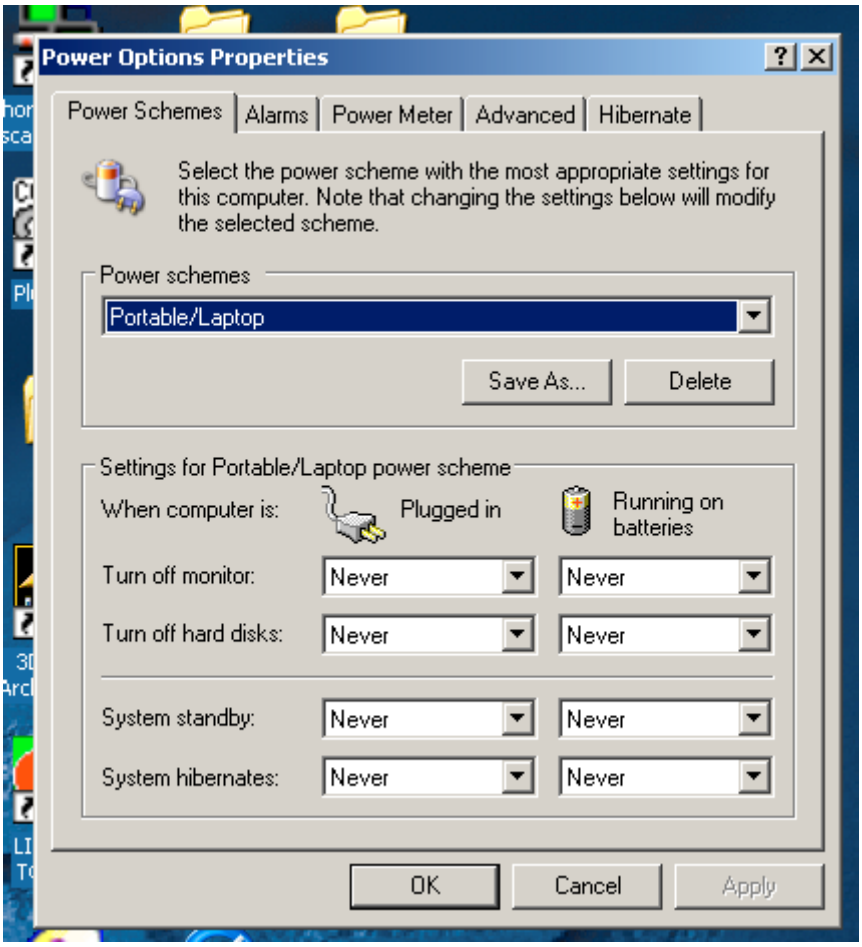


Figure 1-8. Power Management Settings for the Notebook Computer - Windows® XP

    6. Click the ***Advanced*** Button.
    7. In the Advanced dialog box, click the ***when I close the lid on my portable computer*** list of options and pick the ***Do nothing*** option.
    8. Done.

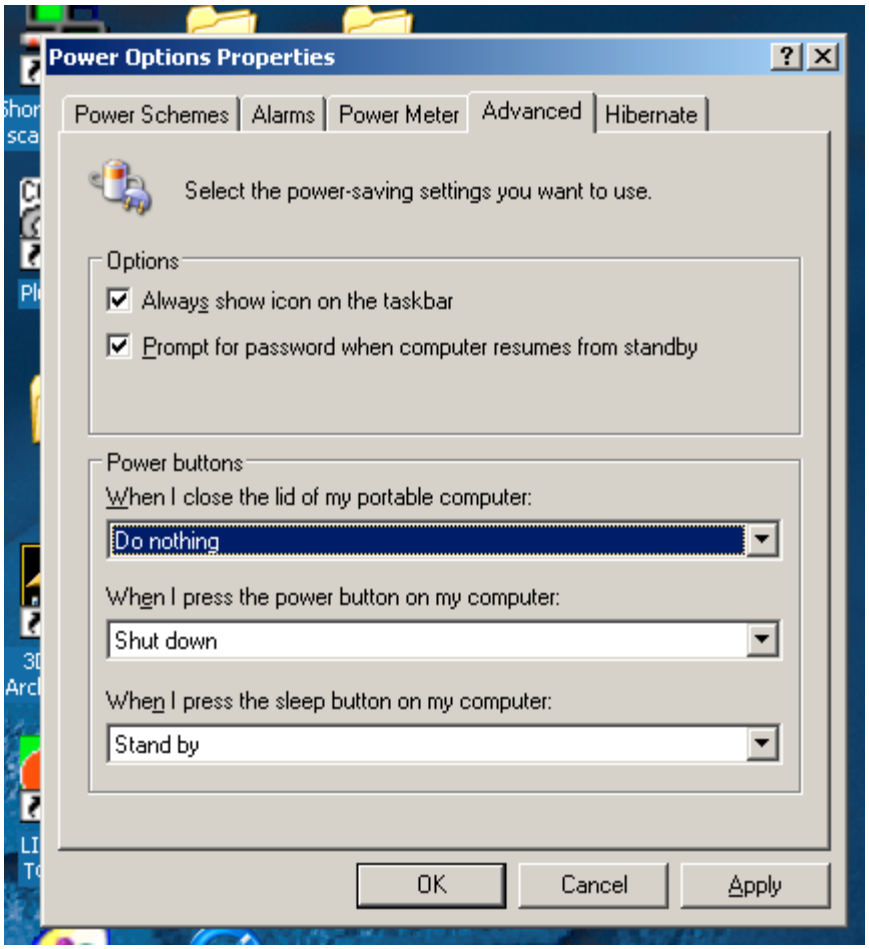


Figure 1-9. Advanced Power Management Settings for the Notebook Computer – Windows® XP

- ***Microsoft Windows® 2000***

  The Power management features and the operating system performance settings on the notebook computers must be set according to the following guidelines:

  - The operating system's automatic (default) ***hibernation*** and ***standby*** mode settings must be disabled**.**
  - The operating system's ***lid closing settings*** on the notebook computer must also be set to ***none*** rather than go on ***standby*** or ***Power off***.
  - The computer should never be put in ***standby*** or ***hibernation*** modes manually while connected to a Collins device via the USB cable. Should this ever happen accidentally, the Collins USB device should be momentarily disconnected and than reconnected again before resuming device operations.

  The previously motioned operating system settings can be configured by performing the following steps:

- **Power management settings**
    1. Click ***Start,*** then ***Settings*** and then ***Control Panel***.
    2. Select ***Power Options.***
    3. In the Power options dialog box, select ***Power Schemes***
    4. Set the ***Power Schemes*** options to ***Always On***

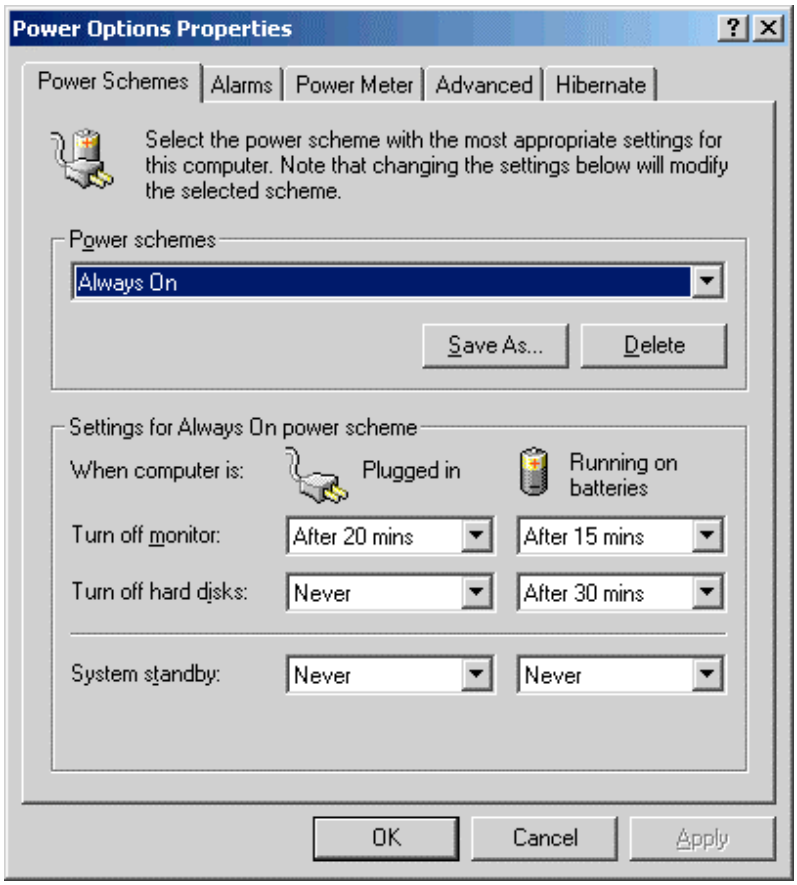


Figure 1-10. Power Management Settings for the Notebook Computer – Windows® 2000

5. Click the ***Advanced*** Button.
6. In the Advanced dialog box, click the ***when I close the lid on my portable computer*** list of options and pick the ***none*** option.

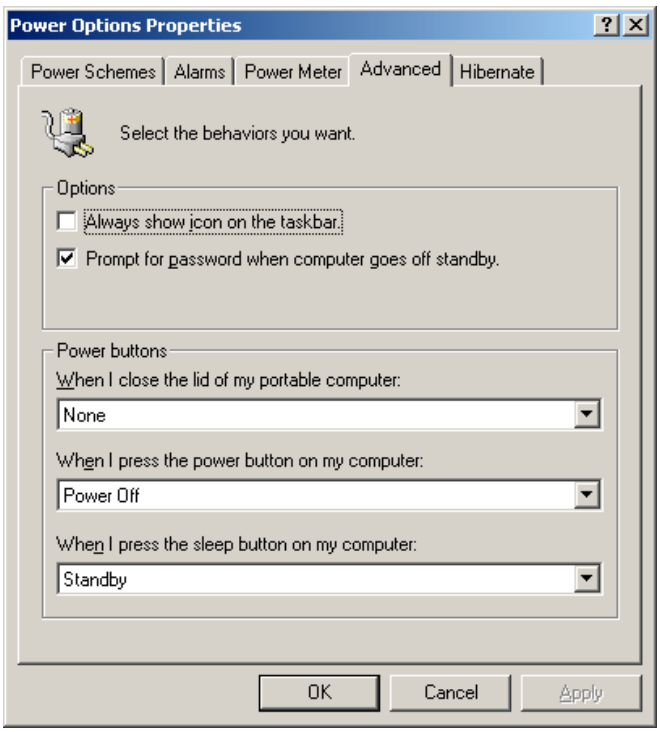


Figure 1-11. Advanced Power Management Settings for the Notebook Computer – Windows® 2000

7. Click the Hibernate Tab
8. Disable the ***hibernate Support*** option

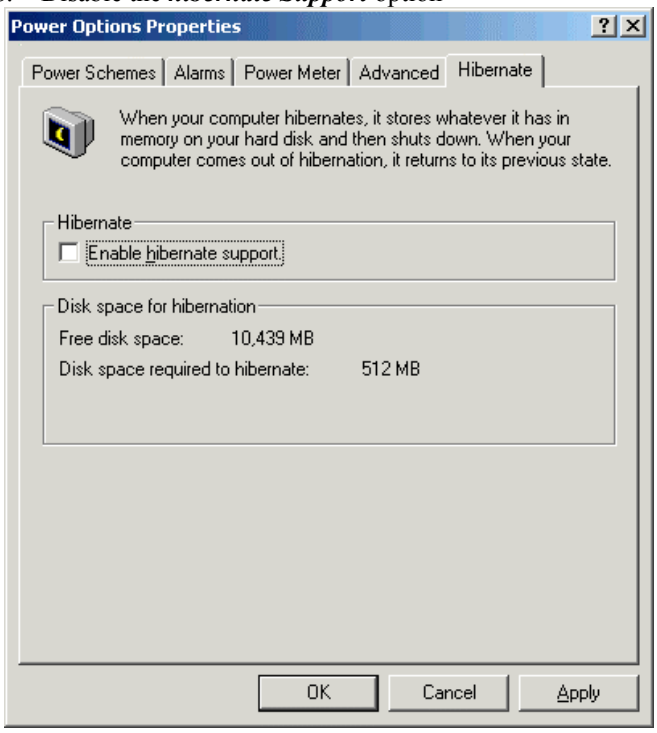

Power Options Properties
Power Schemes
Alarms
Power Meter
Advanced
Hibernate
When your computer hibernates, it stores whatever it has in memory on your hard disk and then shuts down. When your computer comes out of hibernation, it returns to its previous state.
Hibernate
Enable hibernate support
Disk space for hibernation
Free disk space: 10,439 MB
Disk space required to hibernate: 512 MB
OK
Cancel
Apply

Figure 1-12. Disabling the Hibernate Support Button for the Notebook Computer – Windows® 2000

9. Done.

Preparing the Eaglet for Calibration and Verification

1. To prepare the Eaglet for calibration/verification, attach the reduced end of a DC-2 filter to the Eaglet.

2. Attach a 3-liter calibrating syringe to the free end of the DC-2 filter via a breathing tube (Collins #022233).

3. Follow the procedure in the *Calibration* section of the PLUS/2000 manual for *Calibrating the Pneumotach* and *Verifying*. During calibration/verification, be sure to hold the Eaglet in the same position (horizontal or vertical) in which it will be held during testing. Also the Eaglet should be stationary during calibration/verification.

Figure 1-13. Calibration/Verification Setup for the Eaglet

Preparing the Eaglet for Testing

1. Insert the reduced end of a DC-2 filter into the patient port on the front of the Eaglet. The patient will breathe through the DC-2 filter.

   The DC-2 is a low-resistance barrier filter designed for use in preventing saliva droplet contamination of pulmonary equipment, thereby preventing patient cross-contamination. The DC-2 filter may be used alone. However, if the patient has a difficult time maintaining a lip seal on the DC-2 opening, a Collins Comfort Fit® mouthpiece may be attached to the DC-2.

Figure 1-14. Attaching the DC-2 Filter to the Patient Port

2. To complete the test setup, attach a noseclip to the patient.

3. Have the patient hold the Eaglet as shown in Figure 1-15.

Figure 1-15. The Patient Holding the Eaglet during Testing

4. Connect the patient to the free end of the filter, making sure he/she maintains a tight seal with his/her lips.

5. For instructions on conducting spirometry tests, refer to the *Patient Testing* section of the PLUS/2000 software manual. Follow the instructions for conducting the FVC, SVC and MVV tests with the Collins MicroTach (pneumotach).

SECTION TWO -- PERIODIC MAINTENANCE

WARNING:

Before performing any maintenance procedures, make sure the power to the computer is off or that the Eaglet is disconnected from the computer.

The Eaglet has no user internal serviceable parts. Therefore, for issues not covered in Maintenance, or if you are having problems with your system, contact Collins Medical personnel at:

Collins Medical, Inc,
220 Wood Road
Braintree, MA 02184

Phone 800-635-3200
or
781-843-0610 and ask for the Customer Support Services Department

FAX: 781-843-4024

...or your local distributor

Routine Cleaning of the Eaglet Handle

Frequency: As needed

1. Turn off the power to the computer and disconnect the Eaglet from the computer.

2. All external components of the system, including the system covers, used within the patient environment, may be disinfected by wiping the surfaces with a 70% isopropyl alcohol solution. You may also clean the inside surface of the pneumotach core in the same manner.

CAUTION:

***IMPORTANT:* Do NOT immerse the Eaglet in any solution! Make sure that the cloth is completely wrung out so as not to get any solution inside the handle, as this may affect the operation of the Eaglet.**

Do NOT get alcohol on the O-ring at the rear of the pneumotach sleeve.

Figure 2-1. O-Ring at Rear of Pneumotach Sleeve

3. Reconnect the Eaglet to the computer.

4. Turn on the power to the system by powering up the computer.

5. Refer to *Powering up the System* in Section One to verify correct system start-up.

6. If your system does not start up correctly, contact Collins Customer Support Services at the addresses or telephone numbers listed above.

Cleaning the Pneumotach

Frequency: The Collins-supplied bacterial/viral filters designed to be used concurrently with the Eaglet (e.g., the DC-2) significantly decrease downstream contamination. Therefore, under normal use, it is acceptable to clean the pneumotach at periodic intervals according to guidelines set by the hospital or laboratory's infection control committee. However, when contamination is believed to have occurred, such as with contagious patients, it is acceptable to clean the pneumotach after each patient. In addition, the pneumotach should be cleaned when the screen appears to be clogged with proteinaceous matter or other debris.

CAUTION:

***IMPORTANT:* Do NOT immerse the Eaglet Handle in any solution! Make sure that the cloth is completely wrung out so as not to get any solution inside the handle, as this may affect the operation of the Eaglet.**

Do NOT get alcohol on the O-ring at the rear of the pneumotach sleeve.

1. As mentioned above, the inside of the pneumotach may be wiped clean with a well-wrung out cloth dampened with a 70% isopropyl alcohol solution. For a more thorough cleaning, follow the instructions below.

2. Remove the O-ring from the rear of the rear of the pneumotach by gently prying off with a small screwdriver (refer to Figure 2-1 for location of O-ring).

3. Removing the O-ring allows you to twist and slide the pneumotach out of the handle from the back of the sleeve to the front.

Figure 2-2. Pulling the Pneumotach out of the Eaglet Body

3. Clean the pneumotach using the instructions under *Disinfection Procedure for the Pneumotach and Reusable Mouthpieces*, on the following page. Follow the disinfectant manufacturer's instructions for length of soaking. The pneumotach is meant to be soaked and "swished" around in solution, but not scrubbed. Scrubbing the screen may deform it and affect results. Thoroughly rinse the pneumotach and allow it to dry, as any residue or water clogging the screen will affect results.

4. Reinsert the pneumotach into the Eaglet body by pushing it in from front to back. Make sure it is pushed in all the way.

5. Match up the notch in the pneumotach with the seam at the top of the handle.

Figure 2-3. Lining up the Pneumotach Notch with the Seam in the Handle

5. Replace the O-ring at the rear of the pneumotach.

NOTE:

The pneumotach must be recalibrated after cleaning due to possible changes in flow dynamics.

Cleaning the Reusable Mouthpieces

Frequency: After each patient.

Follow the instructions under *Disinfection Procedure for the Pneumotach and Reusable Mouthpieces*, which follow.

Disinfection Procedure for the Pneumotach and Reusable Mouthpieces

CAUTION:

***IMPORTANT:* Do NOT immerse the Eaglet handle in any solution! Make sure that the cloth is completely wrung out so as not to get any solution inside the handle, as this may affect the operation of the Eaglet.**

Do NOT get alcohol on the O-ring at the rear of the pneumotach sleeve.

1. Following is a recommended procedure for disinfecting the pneumotach and reusable mouthpieces.

NOTE:

The following instructions involve the use of the disinfectant Cidex®. Only trained staff may use Cidex®. Wear gloves, goggles and an apron or gown. Avoid skin contact. The solution is caustic and can cause skin irritation.

2. Activate solution - solution turns green when activated.

3. Solution must be marked with the activation date and expiration date. Solution expires 14 days after activation.

4. Wash items thoroughly in detergent and water, then rinse prior to immersion in Cidex®.

5. Immerse in Cidex® for 20 minutes.

6. Remove from Cidex® using aseptic technique and rinse thoroughly with sterile water.
   - Flush interior aspects vigorously with sterile water.
   - Insertion tubes and channels must be thoroughly dried.

7. Discard Cidex® only after it has been neutralized.

Reference: Disinfection Instructions from *John Hopkins Cleaning and Disinfection* instructions at the following Website:

http://hopkins-heic.org/prevention/clean_dis.html

Cidex® Activated Dialdehyde Solution is a product of Advanced Sterilization Products.

Replacing the Pneumotach

1. The pneumotach screen must be flat, taut and free of holes or indentations. If upon visual inspection, the pneumotach screen appears altered in any way, it must be replaced. For example, if it is creased or wrinkled, has holes in it, or seems to sit loosely in the pneumotach core, it must be replaced. If the pneumotach cannot be calibrated or verified, it must be replaced.

NOTES:

If the pneumotach needs replacing, the Eaglet must be returned to Collins Medical so that the replacement pneumotach may be linearized with the specific electronics in the handle.

After replacing the pneumotach, be sure to conduct the calibration procedure.

Figure 2-4. Location of Pneumotach Screen

SUPPLIES LISTING

Accessories and Disposable Items

For more information, refer to our website at www.collinsmedical.com.

Supply #	**Item Name**
022233	Calibration Tubing
021156	Calibration Syringe, 3-liter
700956	Pneumotach with 4 O-rings (see Note below)
670160	Replacement O-ring
022450	DC-2 Filter
022452	box of 24
022454	box of 100
022456	box of 400
022458	DC-2 Filter and Disposable Comfort Fit Mouthpiece
022460	box of 24
022462	box of 100
022464	box of 400
022465	Disposable PFT Kit, includes, DC-2 Filter, ComfortFit Mouthpiece and Soft Noseclip, box of 100
022242	Disposable Comfort-fit Mouthpiece
02240x	Disposable Cardboard Mouthpieces
021231	Disposable Soft Noseclip, package of 25

NOTE:

If the pneumotach needs replacing, the Eaglet must be returned to Collins Medical so that the replacement pneumotach may be linearized with the specific electronics in the handle.

References

1. (ATS guidelines for infection control)
American Journal of Respiratory and Critical Care Medicine, Vol 152, No.6, pp. 2188 -2189, December 1995.

2. (AARC guidelines for infection control)
AARC Clinical Practice Guideline - Spirometry, 1996 Update, reprinted from Respiratory Care, Vol 41, No. 7, pp. 629-636, 1996.

SECTION THREE -- TROUBLESHOOTING

WARNING:
WHEN CHECKING AC POWER CONNECTIONS, CABLE CONNECTIONS BETWEEN SYSTEM COMPONENTS, OR FUSES, MAKE SURE THAT THE POWER TO ALL SYSTEM COMPONENTS IS OFF.

Customer Support

If you are having problems with your system that cannot be resolved, contact Collins Medical personnel at:

800-635-3200
or
781-843-0610 and ask for the Customer Support Services Department.

Manuals

Where the problem is likely to be with the computer, keyboard, monitor, or printer, refer to the manuals accompanying these components for troubleshooting advice. For example, if you are having problems with the print format, refer to the printer manual.

TROUBLESHOOTING GUIDE

Following are descriptions of some common error sources and the steps to take in remedying them. Keep in mind that if you have a notebook computer, references to such topics such as cable connections between the monitor and the computer, AC power connections for the monitor, etc. do not apply.

Problem #1

Nothing displays on the monitor screen, or the PLUS program fails to "boot up" when the computer is turned on.

Check to make sure that:

1. The power to the computer and the monitor is turned on.

2. All cable and AC power connections have been made as described in Section One. Check in particular the cable connections between the monitor and the computer and the AC power connections for each of these components.

3. There are no broken cables. Broken cables can cause a variety of unpredictable problems.

4. The computer components are plugged into proper functioning outlets. Test the outlets with a functioning lamp to make sure. For components with detachable power cords, see that the other end of each power cord is plugged into its respective component as well.

5. The monitor brightness and contrast controls are set sufficiently to allow the display to show up.

6. No diskettes are inserted into the floppy disk drive. If a diskette is inserted, the system will try to boot from the floppy drive instead of the hard disk. A *Non-system disk in drive A* error message will be displayed.

7. Try rebooting the system by pressing Ctrl/Alt/Del. If this does not work, turn the power to the system off for 30 seconds; then turn it back on.

8. Check to make sure that any fuses have not blown. If they have blown, replace them. If upon replacing the fuses, they blow again, contact the manufacturer of that particular device.

9. If all the situations above have been checked, refer to the documentation accompanying your computer.

Problem #2

When you turn on the power to the system, the monitor display is completely white and remains so throughout the computer boot-up procedure.

Check to make sure that:

1. The computer power switch is on, as the above situation occurs when the power to the monitor is on, but the computer power is not on.

2. The cable connections between the monitor and the computer are made as described in Section One and there are no broken cables.

3. The computer power cord is plugged into a functioning outlet.

4. Refer to the documentation accompanying your monitor for further details on determining monitor problems.

Problem #3

The monitor displays a message such as *Communication Error*. This is an indication that the computer and the Eaglet are not communicating. If such a message were to display, it would be most typically when initiating testing or calibration. Check to make sure that:

1. All power cord connections have been made as described in Section One and that the power to all system components is on.

2. The cable connection between the computer and the Eaglet is made as described in Section One and there are no broken cables.

3. The fuses are not blown (refer to problem #1).

4. If any of the problems listed above exist, first remedy the situation and then reboot the system by pressing Escape to get to the Desktop and following the Windows® Shutdown procedure.

5. If the problem is not due to any of the above situations, try rebooting the system by pressing Escape to get to the Desktop and following the Windows® Shutdown procedure. If this does not work, power down the system for 30 seconds and power up again, as electrical disturbances, commonly known as "spikes", can cause occasional malfunction of electrical components.

Problem #4

You are unable to perform testing or calibration operations because the Eaglet does not respond to user-keyboard action.

1. Make sure the monitor brightness and contrast controls are set sufficiently to allow the entire display to show up. Otherwise a prompt which requires a response in order for the program to continue may not be visible.

2. Check all cable and power cord connections, and power switches. Make sure there are no broken cables. Check the fuses, as described in Problem #1.

3. Try to isolate the problem by finding out which components are not responding. If none of the components respond, then there is most likely a communication problem.

6. If the problem occurs during a test procedure, make sure the patient is breathing through the pneumotach. Otherwise, in some cases, the system will not see flow and the program will not proceed.

7. If the problem persists, reboot the system by exiting to the Desktop and following the Windows® Shutdown procedure. If this does not work, reset the power to the system by turning it off for 30 seconds and then on again, as electrical noise may have been the source of the problem.

8. If the source of the problem cannot be located, contact your Collins Service Representative.

Problem #5

You are unable to attain a satisfactory calibration; i.e., you can't get it to Pass.

1. In the *Calibration* section of the PLUS/2000 Manual, refer to the part about pneumotach calibration. Read about the error messages you will get if you do not conduct the procedure correctly.

2. Repeat Calibration, making sure that the entire procedure is performed correctly. Be sure to not wave the Eaglet during calibration. If problems still occur, proceed to the next step.

3. Make sure that the pneumotach is clean and undamaged. Check in particular the screen to make sure it isn't dirty. If the pneumotach needs cleaning, proceed with the appropriate instructions in *Maintenance*. If the pneumotach is damaged, call the Service Department for instructions on replacing it.

4. If you have recently removed the pneumotach for the handle for cleaning, make sure the notch in the pneumotach lines up with the seam at the top of the handle, as described in Maintenance.

5. After remedying the possible source of difficulty, repeat the calibration procedure. If none of these steps results in successful calibration, contact your Collins Customer Support Services representative.

Problem #6

Test results appear unreasonable, i.e., they are either much higher or much lower than expected.

1. Make sure that the system is calibrated properly and that all the conditions in the Calibration problem, above, are met. The pneumotach should be verified prior to each test. Calibration should be performed under the following circumstances:

   a. The first time the PLUS/2000 program is run.
   b. Each day before conducting tests.

c. Any time an error dialog indicates that a valid calibration file can not be read into memory.
d. Each time a new version of the PLUS/2000 program is installed.
e. After disassembly and/or cleaning the Eaglet.

2. Conduct a Verify procedure at a variety of flow rates (see the PLUS/2000 software manual under *Pneumotach Calibration*) to see that it is measuring correctly. If it is not, repeat calibration, making sure that the entire procedure is performed correctly.

3. Be sure you calibrate under the same conditions as you are testing, e.g., you hold the pneumotach in the same position (horizontally or vertically), you use the DC-2 filter for both procedures, you eliminate movement of the Eaglet during both procedures.

4. The patient was wearing a noseclip and he was making a tight seal around the mouthpiece. If maintaining a tight seal around the filter mouthpiece is a problem, attach a flexible mouthpiece to the filter.

5. Setup was correct prior to testing.

6. The test was started properly, according to the PLUS/2000 manual.

7. The test was ended properly.

8. The correct keys were pressed for each operation.

9. The correct preliminary and patient data were entered.

10. The patient performed the test correctly.

11. The correct patient age, height and gender were entered. Otherwise, percentage of predicted results may be distorted.

Problem #7

The printer does not respond when a printout is initiated from the keyboard.

Check to see that:

1. The power to the printer is turned on.

2. The printer is in the on-line mode.

3. The printer AC power cord is plugged into an appropriate outlet.

4. The cable connections between the printer and the Computer are made as indicated in Section One.

5. Be certain the printer is recognized by MS Windows® as an available, selected device.

5. Make sure that the printer is configured for the correct print functions. Refer to your printer manual for how to set these functions.

6. Refer to the printer manual for more details on printer malfunction.

Problem #8

Pressing the End key or the Arrow keys on the numeric pad produces numerical data on the screen instead of the desired action.

If this is the case, most likely the Num Lock key has been pressed inadvertently, thereby activating the numeric functions of these keys. To rectify this situation, press the Num Lock key. The non-numeric functions of these keys will thus be restored.

USER PROBLEM CHECKLIST

1. If a user suspects there is a problem with the Eaglet system, first determine:

   a. Is it a fault within the system or is it a problem with the patient or a test procedure?
   b. Is the test being conducted as described in the instruction manual?
   c. Is the system set up as described in the PLUS/2000 and the Eaglet manuals?

2. Then, define the problem as specifically as possible. For example:

   a. Are the test results inaccurate? Which test? Are the results greatly exaggerated?
   b. Does the system have any leaks?
   c. Is the problem electrical in nature? (Circuitry, lights, computer, power cords, etc.)

NOTE:

If you get water on or near the electrical circuitry, power down the system immediately and unplug all AC power cords from their outlets. Do not reapply power until all water or moisture is completely eliminated. Contact Collins Medical, Inc. if necessary.

   d. Is the problem mechanical in nature? (printer problems, monitor problems, pneumotach problems. etc.?)
   e. Is the problem in the pulmonary software (The Collins-supplied Program Disk(s)? Was the program loaded correctly?
   f. Were the questions in the Configuration program, especially the hardware section, answered correctly?

3. Next, perform the following simple system checks:

   a. Is the electrical power to the system turned on?
   b. Are all system component power switches turned on?
   c. Are any fuses blown? Are there any loose connections?
   d. Was the system set up properly before testing began?
   e. Did the test start properly, according to the manual?
   f. Did the test end properly, according to the manual?
   g. Was the correct patient data entered? Was the data entered into the computer properly?
   h. Was the wrong key pressed?
   i. Did the patient perform the test exactly as instructed?
   j. Did the operator perform the test as described in the manual?
   k. Was the system calibrated correctly?
   l. Is there any clue as to why the test results are inaccurate? (Recent calibration or maintenance, for example.)
   m. Were there any changes to the system since the last test was conducted?

4. Now, list all possible details relating to the suspected problem, including but not limited to:
   a. Temperature and barometric pressure (especially for areas at altitude) of the testing room.
   b. Patient's height, weight, age, sex, race.

NOTE:

Beware of confusing height or weight units, as this will cause inappropriate predicted values to be calculated. Let's say, for example, that in the Patient Information program, you enter a height of 66 inches in the metric units box. The program would assume 66 centimeters and the predicted values would be incorrect.

   c. Type of test in question, if known. (Save a printed copy.)
   d. Any modifications, maintenance, or calibration performed on the system since the last correct test results were obtained.
   e. All calculations performed, if available (if applicable, attempt to manually calculate the test results to compare with the suspected inaccurate computer-provided results).
   f. The exact sequence of steps that led to the problem. Can you cause the event to occur repeatedly? Make a note of the exact procedure used, including keystrokes and handling of the equipment.
   g. All miscellaneous aspects of the suspected problem.

5. If the source of the problem is found:

   a. Can it be fixed without outside help?
   b. Is enough information available to discuss the problem over the telephone with a service representative?
   c. Is an on-site visit from a service representative necessary? (If in doubt, call Collins Medical on the telephone first.)

6. Finally, if the source of the problem cannot be determined:

   a. Is all possible information about the problem written down and available? Could someone else understand this information if the usual operator were not available?
   b. Is enough information available to precisely describe the problem over the telephone to a service representative?
   c. Is all relevant information written down legibly for a service representative to evaluate on-site?
   d. Has everything been double-checked?

7. When calling Collins Medical, Inc. for Service or Technical Support (800/635-3200):

   a. Identify the type of system you have. Make sure you know the following:
      Your Customer Number
      The type of computer in your system
      The program name (e.g., PLUS) and version (e.g., PLUS 2000, ver. 4.4). To find the version number, click on *Help*, then *About…*.
      The serial number of your Eaglet

   b. Have all information regarding the problem. Let the technician know the error messages you are getting and when they occur, if applicable. Describe what you were doing when the error occurred and the steps you have taken to attempt to solve the problem.

c. Call from a telephone at or near your computer. You may be asked to type some commands at the keyboard, or make minor adjustments, relay detailed information during operations, or try other troubleshooting steps at the system itself.

d. For all third party software, such as Excel® for Windows®, contact the manufacturer of that particular software for troubleshooting advice.

Collins Medical, Inc.
220 Wood Road
Braintree, MA 02184-2403
(781) 843-0610 (800) 225-5157
FAX (781) 843-4024
www.collinsmedical.com